

## EDITORIAL

# Image-guided tumour ablation—a new opportunity

A Gillams

*Medical Imaging, The Middlesex Hospital, Mortimer Street, London, W1T 3AA, UK*

*Corresponding address: A Gillams, Medical Imaging, The Middlesex Hospital, Mortimer Street, London, W1T 3AA, UK. E-mail: a.gillams@medphys.ucl.ac.uk*

Date accepted for publication 30 July 2004

It is less than 20 years since the very first papers on ultrasound (US)-guided ablation of liver tumours were published. Initially ablation centred on US-guided percutaneous ethanol injection (PEI) in small, non-resectable hepatocellular carcinoma (HCC) and neodymium yttrium aluminium garnet (NdYAG) laser heating techniques in liver metastases. Since then radiofrequency ablation (RFA), microwave, percutaneous cryotherapy, percutaneous acetic acid injection, photodynamic therapy and high intensity focussed US have all been used. Technological development has seen increased power application, water-cooling and the development of an array of different applicators. Currently the majority of centres use radiofrequency, a heating technique whereby alternating current produces ionic agitation and frictional heating in the tissue immediately around the electrode. US guidance remains the optimal, quickest technique for applicator placement but monitoring has become more sophisticated with micro-bubble contrast-enhanced US, multi-planar, multi-slice or preferably co-registered 3D computed tomography or magnetic resonance (MR). Initial hopes for MR temperature monitoring have not yet been realised. Changes in T1 and proton resonance frequency can provide temperature information but require subtraction imaging and work well in areas where image co-registration is easy. This does not apply to the liver which remains the commonest site of tumour ablation.

The treatment of HCC has been the most fertile area for the development and clinical acceptance of ablation techniques. The alternatives chemo-embolisation and resection either have limited impact on survival or limited applicability and high co-morbidity. PEI and surgical resection have similar survival results in retrospective studies. On-going prospective studies comparing PEI and

RFA show significantly improved disease-free survival with a trend at 2 years of follow-up towards improved overall survival for the RFA group. Acceptance of ablation for liver metastases has been harder, yet more and more surgeons are adopting ablation as an adjunct to resection. There is no doubt that, as a much less invasive therapy, ablation is the treatment of choice in those who cannot undergo a major surgical procedure (surgical resection carries a mortality <3% and major morbidity of approximately 25%) yet have limited liver metastases. Currently ablation is offered to patients who cannot undergo resection because of inadequate liver reserve, inadequate surgical margins, co-morbidity or patient volition. Most patients have colorectal, breast or neuro-endocrine metastases.

Ablation has been performed in many other sites including lung, kidney, adrenal, pleura, bone, pelvic tumours, nodal masses, etc. Most applications are aimed at a reduction in tumour load but ablation has been performed to switch off hormone secretion, for example in adrenal Conn's tumours. Two particularly promising areas of development are RFA for inoperable lung cancer and as a minimally invasive, nephron-sparing technique in renal cell carcinoma. The ability to destroy tumour *in situ* in multiple different locations using a minimally invasive technique opens up whole new categories of patients who can be treated. Other important questions include the impact of ablation on the immune system and the interplay between immunotherapy and ablation.

In conclusion, image-guided tumour ablation is going to be a large growth area in the next decade. Further technical improvements are needed, together with improvements in monitoring and most of all better definition of the clinical groups that can benefit from this technique.

This paper is available online at <http://www.cancerimaging.org>. In the event of a change in the URL address, please use the DOI provided to locate the paper.